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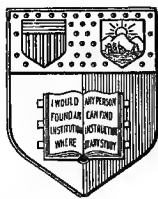
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Progress in dairying ...



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PROGRESS IN DAIRYING

EVIDENCE

OF

JAMES W. ROBERTSON

COMMISSIONER OF AGRICULTURE AND DAIRYING

BEFORE THE

SELECT STANDING COMMITTEE

ON

AGRICULTURE AND COLONIZATION

1903

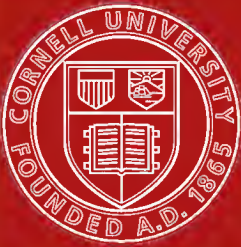
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PROGRESS IN DAIRYING.

HOUSE OF COMMONS,
COMMITTEE ROOM 62,

WEDNESDAY, April 1, 1903.

The Select Standing Committee on Agriculture and Colonization met here this day at 10 o'clock, a.m., Mr. Douglas, Chairman, presiding.

Mr. J. W. Robertson, Commissioner of Agriculture and Dairying, appeared before the Committee and made the following statement:—

Mr. CHAIRMAN AND GENTLEMEN,—It was my misfortune last year to be called to England and thus prevented from meeting the Committee and offering the customary information regarding the work of the branch of the Department of Agriculture which is under my charge. The export commerce of this country in farm products is growing very fast. The export of food products only from the farms has grown from \$24,680,572 in 1890, to \$80,705,184 in 1902. I do not know of a similar record in the growth of the commerce of any country. That does not reveal the whole increase in the production of food products from Canadian farms. There has been in that period a reduction in the number of people producing foods in Canada and a very substantial increase in the number of people consuming food products. There is the development of mining and its allied industries; there is the extension of lumbering and the establishment on a large scale of the wood pulp and paper businesses; there is the marvellous growth of domestic and export commerce and also of manufacturing, with a consequent increase in the population of the towns and cities; and there is a remarkable development and increase of traffic in railway and steamship transportation. In a word, there are more people consuming and fewer producing, per thousand of the population, and good times generally with their more generous consumption. Notwithstanding that, the Canadian farmers have produced the bulk of the foods for the people of the whole Dominion, and whereas they spared only, in round figures, \$24,000,000 for export in 1890, they were able to spare over \$80,000,000 for export in 1902. Now that wonderful increase seems to me to be due to the advancement of education and organization among the farmers; and I am confident that the extension of these same two factors and means will bring about an equal advance in every department of Canadian national life. The farmers are making not merely sure progress, but swift progress. In three directions there has been this progress: in ability to manage the conditions that surround their business and to carry on its operations with skill; in intelligent understanding of the laws and forces of nature, which constitute and control some of these conditions; and in co-operation among themselves and with other interests and persons in the country, such as those of transportation and commerce. I am not going to speak at any length this morning on the meaning of these three qualities or capacities, viz., progress in ability, in intelligence and in co-operation, but they constitute education and I think there is no other education worthy the name. I know it is supposed to be in the Canadian constitution somewhere that questions and matters of education are reserved exclusively to the provinces and provincial legislatures, but I happen to be a living example of the action of at least one of the Dominion departments in promoting education, and to see the record of the results of that action in a large measure in the growth of the value of our food exports.

There is a heap of foolishness abroad, if I may use that word in a parliamentary committee, as to the meaning of 'education' and 'educated person.' If you take the uneducated—that is the baby, helpless, ignorant and selfish—you find the only marks of lack of education, in its helplessness, ignorance and selfishness. Advancement out of helplessness into ability, out of ignorance into intelligence, and out of selfishness into co-operation for the public good, means real progress in education. Not by going so many days to school or taking a course in college is education gained, but by doing the right things in the right way at the right time. The farmers are doing that, and therefore they are causing gratifying progress in the development of the country.

The main difficulties they meet with generally are four in number. There are the difficulties in the growing of crops. There are the difficulties in the maintenance of fertility. In France the people have managed to double the yield of their crops per acre in forty years, while we in Canada have managed to cut the yield of our crops in half, per acre, in many places in the same time. We began with virgin soil and they began with a worn-out soil. That is a striking contrast as to methods of farm management and the value of real education among the working farmers. Then there is the difficulty in keeping live stock profitably. I will use that chart which you see on the wall, shortly, to illustrate that. Then lastly there are the difficulties of preparing the products for markets.

THE SCOPE OF THE BRANCH OF THE COMMISSIONER.

In administering the branch of the Department of Agriculture under my more immediate charge, we put the work into seven divisions—the division of live stock, the dairy division, the cold storage division, extension of markets division, the seed division, the fruit division, and the poultry division. Each of these divisions has to do with some of these four difficulties—crops, fertility, live stock, or preparing products for market—and each one needs to have more than one capable man following the developments with care and skill. Some of the men need not merely to bring to their work accuracy, intensity and ability, but leisure time and a habit of meditation or reflection on what they have seen and learned, in order to see what might be done better. There is sometimes so much of a rush in the work of administration that a man in the public service does not have sufficient quiet time to think. In every nation's progress the leaders must be men who have leisure to think, and to plan, as well as merely to carry on the administration of the department.

This morning I now want to speak without much detail, on the progress in dairying education along some of its newer lines. Since the effort to improve dairying in Canada was first organized—it was first organized in a partial manner by voluntary associations of farmers and otherwise—but since it was first organized under the direct care of the provincial government in the province of Ontario in 1885, the exports of cheese and butter have grown very rapidly and are growing steadily. Not by an accidental advance, but by steady evolution and progress in dairy work all over the Dominion. In 1886 the value of cheese and butter exported from Canada was, in round figures, \$7,500,000. Ten years later it was \$15,000,000—double in ten years. That is since the beginning of organized effort on the part of the Ontario government. Then take the last ten years, during which the work was more generally organized in the whole Dominion, and from 1892 to 1902 the increase in the value of exports was from \$12,700,000 to \$25,300,000—again double, even on that large scale. There is another instance of growth equal to that; it is in the pork and bacon business, in which, before any systematic effort was made to put it on a rational, profitable basis, for and by the farmers, there was an export business of about \$600,000 a year: that was in 1890. It had grown to \$4,500,000 in six years (1896), and then in six years more (1902) it had grown to \$12,500,000 of exports. I hope you take in the meaning of these few figures; exports of bacon and hams worth a little over half a million of dollars in 1890; \$4,500,000 in 1896, and \$12,500,000 in 1902. When you hear a good deal about the prosperity of Canada arising from the settlement of the North-west, do not be

misled in your judgment. The progress of this great Dominion has not been due to the prairies as yet, but to the farms and farmers of the other, the older settled parts of Canada. A large development may come on the prairies of the North-west later on, but just yet our progress and prosperity are seen chiefly on the ordinary farms on this the eastern side of the Great Lakes. Let me give you three instances, because I would like to have the Committee join me in believing that the possibilities of development in Canada are simply unlimited in this sort of work. We have not come to the end yet. Take one instance which is familiar to the Committee. I have given fuller details on many previous occasions, and not to waste the time of the Committee, I shall offer very short illustrations.

CO-OPERATIVE DAIRYING IN PRINCE EDWARD ISLAND.

There are certain places especially adapted for certain industries. The province of Prince Edward Island is especially adapted for butter and cheese factories, but that business was going backward for want of information and education. In the year 1892, with the assistance of money given by the Dominion government, I started one co-operative cheese factory at New Perth, in Prince Edward Island. The machinery was loaned by the government. We sent an instructor to organize the business and to arrange the locality into routes for the convenience of those supplying milk. We ran the factory as a government dairy station. In the autumn of 1892 I took the liberty of exporting to London \$3,600 worth of cheese manufactured at that station, and I can recall the remonstrances of some of the people against risking their cheese in any steamer. I got fault finding letters asking me why I did not sell the cheese at home or in Halifax. I had been in England and knew something about the English market; and as I had insured the cheese for about 12 per cent more than it was worth, I felt easy on the subject. The cheese got to England, and was sold there for the top market price. Some of it indeed sold for sixpence per cwt. more. I angled for that sixpence and got it. Then, when the Island people knew that they had got sixpence per cwt. more for their cheese than was paid for any other Canadian cheese sold that day in London, it assured them that they could make fine cheese. That was the beginning of the export of cheese—to the value of \$3,600.

At the taking of the census in 1891 there were four cheese factories in Prince Edward Island, with an output worth \$8,448; when the census of 1901 was taken there were 47 cheese and butter factories, with an output valued at \$566,824. There is the result of organization and education. There has been no increase in the number of acres of land, and there has been but little increase in the number of cows kept. The change has been in the intelligent labour applied to the conditions. The people now run their own factories, and have repaid to the government every dollar that was lent to them. I don't say that you could do this with dairying everywhere, but it can be done anywhere where the locality is adapted for it. There is no part of agriculture that is not susceptible to the same kind of improvement.

ONTARIO AND QUEBEC.

Take another instance on a larger scale. The province of Ontario is noted for the products of its cheese factories and creameries. It has made great advancement in quality and in quantity as between the two census periods 1891 and 1901. It increased the value of its output of butter and cheese from factories by over seven millions of dollars in ten years; that is to say, the value of the output in 1901 was \$7,136,965 more than the value of the output in 1891. The province of Quebec had not advanced so far in co-operative dairying; but a beginning had been made in organizing its cheese factories and creameries into syndicates. The syndicate was a group of cheese factories employing the services of a travelling instructor.

In 1892 I had the pleasure and honour of helping to start a dairy school for the province of Quebec. I was a director of that school for some years, and the Depart-

ment of Agriculture at Ottawa authorized me, as Commissioner, to turn in \$3,000 a year of Federal money to help the dairy school at St. Hyacinthe. Of course, I am not a constitutional lawyer. I was not supposed to know, and I confess I do not yet know, that the constitution of the Dominion reserves all questions and matters of industrial or technical education to the legislatures of the several provinces. I was not well informed with regard to that particular part of the constitution, and I confess I did not care very much. The constitution of a country, like the constitution of a man, may be for the weal of the country; and the weal of the country need never be subordinated for the sake of literal compliance with the phrases of its written constitution. 'The Sabbath was made for man and not man for the Sabbath.' So \$3,000 a year of Federal money went to the province of Quebec to promote dairying and agriculture by means of education. We did not call it education. That might have been an unconscious slap at the constitution. We began by giving short courses in dairying. Some of the wiseacres said it was foolish to think of imparting any education worthy of the name in a two weeks' course. However, we made it a rule that only students should be admitted who had worked for one year in a cheese factory or butter factory. We had neither the time nor the money to devote to those floating atoms who, in an indefinite way, wanted a college education for dairying. So no one could get the course at St. Hyacinthe unless he had previously had one year of practical experience. These were the very people we wanted to help. These were they who needed help. Then, the provincial authorities went further in organizing the factories in syndicates. No one was allowed to become a syndicate instructor unless he had taken the course, or courses, of instruction at the St. Hyacinthe Dairy School. During the first year (1892-1893) 214 students took the course. The next year 268 students took the course. The third year 328 students took the course; and so on.

Let us come back now for a moment to the census period, and see what the census says about the progress of co-operative dairying in the province of Quebec during that period. I have said that the province of Ontario did very well in the census period in the development of its cheese and butter business. The value of the output of the cheese and butter factories in Ontario in 1901, was \$7,136,965 more than it was ten years before. I am referring now to the growth and not to the total output. In Quebec the output was \$9,343,371 more than it was ten years before. The Quebec people were said to be backward, but they made this advance because of the instruction given in dairying by means of education and organization. I could multiply such cases all over the Dominion, but I have said enough, I think, to show that there is good reason for expecting success in helping agriculture in all parts of Canada by improvements in the organization of education and in its quality as applicable to farm life and work.

By Mr. Ethier:

Q. What year was that St. Hyacinthe school opened?

A. In the year 1892.

By Mr. Cochrane:

Q. Have you the figures with you that you can inform me the first year that creameries were established in Ontario?

A. In the same year as Quebec—1862 or 1863—by Mr. Harvey Farrington in Ontario and Mr. James Burnet in Quebec.

By Mr. Ross (Ontario):

Q. Is that right about the creameries?

A. That was cheese factories—the date that cheese factories were organized.

Q. Mr. Cochrane asked about creameries.

A. I beg pardon, I am afraid I misunderstood. I cannot say from memory when the creameries were first established, but I think about 1880. The cheese factories and creameries of the province of Quebec are grouped into syndicates and they have travelling instructors employed by the Dairymen's Association of the province of Que-

bec, which pays half the salaries out of a grant received from the provincial government. There was systematic instruction and inspection, and every one of these instructors had to take a course at the St. Hyacinthe Dairy School.

ORGANIZATION OF COLD STORAGE SERVICE.

Another matter of importance was the organization of improved transportation under the name of cold storage. Let me give an illustration to show how this has been put into practical operation in Canada. Take the butter trade of Canada, which for export had shrunk to next to nothing, less than ten years ago. I need not remind those here of the kind of butter we got on hotel tables from twelve to fifteen years ago. Even the ordinary butter of commerce now is generally good. The export of butter from Montreal in 1894 was, in round figures, 32,000 packages. There was no organization in respect to the carriage of butter in cold storage. No one could get cold storage unless he had a carload to forward. No one could get cold storage on ship board, and few had it at the creameries. We started the organization of a cold storage scheme in 1895. We arranged with the railway companies to run refrigerator cars once a week for the development of this business. Last summer they were running refrigerator cars weekly from something over forty starting points to Montreal. The small shipper of a few packages could get his butter carried as safely as the shipper who had hundreds in his lot. Cold storage was arranged for at creameries. A small bonus was offered to all who would provide cold storage chambers and maintain them in accordance with regulations. Cold storage was provided on over thirty ocean steamships. The scheme became a national system of cold storage, whereby the product of the small shippers could be carried without deterioration from the starting points in Canada to the destinations in the United Kingdom. One result of the organization of service has been that the export of butter from Montreal, which was 32,055 packages during the season of navigation in 1894—before cold storage—had increased to 539,000 packages in 1902. The increase was sixteen fold in eight years.

By Mr. Sproule:

Q. Was all of that sent in cold storage?

A. Not quite; of the 539,000 packages, 525,735 packages went in cold storage.

GOVERNMENT CREAMERIES IN NORTH-WEST TERRITORIES.

In passing I would speak of one minor point of the dairy education work, and that is the establishment and maintenance of creameries in the North-west Territories by the department, as showing again the value of organization and education. Creameries were assisted in the North-west Territories by the Dominion government for three purposes: (1) for educational purposes, (2) to direct attention to the development of the country and (3) to help the new settlers for the time when they had most difficulties and the least chance of revenue. These three objects were clearly stated in the publications of the time; and I have no hesitation in saying that in many cases where we had creameries at first there will be no creameries after a number of years. The people there from climatic, soil and labour conditions will necessarily in farming devote their attention to producing grain and meats of different kinds. That is the destiny of large areas in the North-west Territories because of the conditions there. The climate, the want of suitable labour and other circumstances are not favourable to the development of dairying except in Alberta and in small parts of Assiniboia and Saskatchewan.

At that time (1896) the government arranged to make certain advances to creameries, and twenty dairy associations got something over \$52,000 in advances, in several instances to help them out of really dire straits. People who started creameries themselves at an earlier date had let them fail; they had lost all their money; the accounts were in a most unfortunate state, and in every sense they were in bad condition. Since the department undertook to help them these people have repaid to the department

nearly \$36,000 of the advances; eleven of the creamery associations have repaid all that they got, and others are paying up steadily, except two that are closed, at which, I think, the advances will not be repaid. I need not detain the Committee with a detailed account, but I would be glad to put in this typewritten statement of the amounts advanced and repaid and other facts the Committee might like to have in connection with this subject.

STATEMENT showing total amounts advanced as loans and as payments for apparatus and fitting up of different creameries operated by the Department of Agriculture in the North-west Territories; also repayments of these advances.

Creamery.	Cash Loans.	Advances for Apparatus.	Total Amounts of Advances.	Repayments before 1902.	Repaid in 1902.	Amounts due to Department.
	\$	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Aetna		277 33	277 33	277 33		
Churchbridge & *Dongola	600	4,618 61	5,218 61	5,218 61		
Edmonton & *Tributaries	3,000	2,758 81	5,758 81	1,195 70	158 12	4,563 11
Grenfell		3,464 92	3,464 92	3,464 92		
Innisfail & *Tributaries	4,500	2,594 44	7,094 44	5,383 33	1,076 32	1,711 11
Maple Creek		1,619 86	1,619 86	548 02		1,071 84
Moosejaw	750	1,661 74	2,411 74	2,411 74		
Mosomin		2,558 61	2,558 61	1,435 40	130 66	1,123 21
Olds		1,262 14	1,262 14	1,131 22	70 80	130 92
Prince Albert and *Duck Lake	1,000	2,206 19	3,206 19	735 00	147 27	2,471 19
Qu'Appelle		2,171 31	2,171 31	1,306 98	104 63	864 33
Red Deer		1,464 91	1,464 91	1,464 91		
Regina & *Craven		1,729 18	1,729 18	1,619 49		118 69
Saltcoats		651 64	651 64	651 64		
Saskatoon		206 48	206 48	206 48		
Tindastoll & *Swan Lake		1,421 74	1,421 74	1,421 74	215 80	
Wetaskiwin & *Tributaries		3,786 93	3,786 93	1,852 88	455 36	1,934 05
Whitewood		2,732 43	2,732 43	2,732 43		
Wolseley & *Moffat		2,962 21	2,962 21	912 73	163 33	2,049 48
Yorkton		2,474 82	2,474 82	2,474 82		
	9,850	42,624 30	52,474 30	36,436 27	2,522 29	16,037 98

* Skimming Station.

By Mr. Sproule:

Q. Before taking up another subject I would like to ask for a little information upon one matter with which you have already dealt. You said that 539,000 packages of butter were sent out of Canada, of which 525,000 packages were sent in cold storage. Therefore there seemed to have been 13,000 boxes sent otherwise. Have you any information as to the amounts realized from that sent in cold storage as compared with that not sent in cold storage?

A. Practically nobody ever sends fine butter to Great Britain not in cold storage; but there is still some butter sent as ordinary freight, low grade butter for which shippers are not willing to pay the extra freight charge for cold storage. Creamery butter going outside of cold storage in summer would not come within two cents a pound of the selling price of the same butter sent in cold storage. Some butter goes to Newfoundland and the West Indies not in cold storage.

By Mr. Cochrane:

Q. What would you understand by cold storage, ventilated compartments?

A. No, an insulated chamber, cooled by mechanical refrigeration.

In reference to the creamery output in the North-west Territories, the Committee may be interested to learn that even up there with the heavy freight charges, when

butter was shipped from these creameries to the United Kingdom under well-organized management the farmers have got good prices. The average price last summer for all the creameries in the North-west Territories under the charge of the department, after taking off all freight charges, was 19.6 cents a pound of butter at the creameries. The average price for winter butter (we ran four creameries in the winter), has been between 23 and 24 cents a pound, so these people are getting fair prices and are now, as you may infer, very well served.

THE COOL CURING OF CHEESE.

Now I come to deal with what the department has been doing towards the further improvement of the large cheese trade and giving it as safe an outlook as departmental assistance could help it to have. In England there has been a change in the taste of the people in regard to nearly all their foods. They now want nearly every sort of animal product of much milder flavour than years ago. They want their cheese especially mild, soft, and as they call it, fat. It is quite impracticable to have a cheese retaining a mild flavour in a fat body if it is kept above 60° of temperature during the ripening period; and our climate in Canada in summer goes a long way above that. Therefore there is need for controlling the climate in the particular place where the cheese is kept, to enable us to meet English demands in reference to the qualities they want. As long ago as 1892, the department began investigations into the best methods of curing cheese.

In 1899 we took practically the whole of the product of two cheese factories and cured them at different temperatures, one in Quebec and one in Ontario. We did that also in 1900. Our investigations made this quite clear, that cheese cured at a temperature continuously under 60° was worth more in the market, had better flavour, better body, and lost less weight by shrinkage, than cheese cured at the usual temperatures. These were important points to have demonstrated on a large scale. Still there is a difference, as the members of this Committee will very well know, between discovering and announcing a truth on a scientific basis and getting that applied to the business of the country so as to make it profitable. The scientific men, I use that word in its widest common-sense meaning, the men with the largest range of organized knowledge, classified knowledge, the scientific men are usually away in advance of the men who are engaged in industrial, manufacturing or directly productive occupations. Just as that distance is shortened, just so much as that distance is reduced, does the work of the investigators help the men who are actively engaged in the business of production and manufacturing. How could we shorten that distance, in the cheese industry? We tried by publishing documents. That helped in some measure. We addressed conventions; we did everything we could to bring about a knowledge of this improved method of curing cheese and to show its benefits. But something inherent in humanity seems to keep the average man from applying a principle into practice efficiently until he has seen it actually so applied successfully. There is ever recurring need for the object lesson, the example, the practical illustration. If you look over history you will find that the philosophy—the testimony, the service to truth—that takes concrete form in some fine ideas, lived out in their fulness to their corresponding ideals by some person, is the one that attracts followers.

Let me make an explanatory parenthesis here. There is a real difference between knowledge and ability. There is a wide difference between soil physics and practical tillage. Every man who understands soil physics can manage land and crops better than if he did not understand the principles. Knowledge will help every man to greater ability, but it does not in itself constitute or confer business ability. A man may know all about the composition of a soil and still be a poor farmer. Therefore, some one may say, 'Throw knowledge to the winds.' Not so. Every man does better insofar as he knows more and knows better; but a man may know much and not be able to apply it. There is a difference between scientific knowledge and the business

application of it. Huxley once said he could not grow as big turnips as Hodge, but he could tell Hodge what would enable him to grow still bigger turnips and to make more money.

As an instance of how intelligent cultivation may affect the temperature in the soil, let me mention the result of certain experiments by King on eight farms in Wisconsin. When land was rolled after being seeded the temperature between 1 and 4 o'clock in the afternoon was about 3 degrees higher at points between 1½ to 3 inches in depth than on similar land left unrolled. The explanation of that is in the fact that the rough surface radiates heat, while the smooth surface gives the best chance for absorbing the heat of the direct sunshine.

A difference of 3 degrees in the temperature of the ground may make all the difference between a good start and a slow start in the growth of the crop. If you could have that simple fact known all over Canada it would be of great benefit. If the boys attending the rural schools would demonstrate the fact by experiments of their own, using a thermometer, do you think any of them would forget the results? That, in itself, would be a valuable part of education for the boy. It would mean a better understanding of natural forces; it would awaken other curiosities, and so the boy would be led out into further knowledge and ability. That is only a bare instance for illustration and not for definition.

Everyone knows now that to get this increase of temperature land should be rolled after the seed is sown, and then a light harrow run over it afterwards to kill the weeds and keep the moisture in the soil. Now weeders are going into Manitoba in car-loads, to harrow the land after sowing and rolling; and so to save the moisture for the growing crop. There is value in a knowledge of soil physics as applied to practical work.

By Mr. Wright:

Q. Does that apply to any soil?

A. To any soil in sunny weather in the spring.

Q. To give a smooth surface?

A. A rough surface allows the heat to radiate; a smooth surface absorbs and retains more of the heat from the sun.

By Mr. Cochrane:

Q. Was there any more moisture in the land that was rolled than the unrolled land?

A. The thermometers were put alongside on the same farm, and these showed the difference in temperature only.

Q. The thermometers showed a difference?

A. I think the land would dry out a little faster on the surface of the unrolled land. After the light harrowing which follows the operation of rolling, that surface would dry out still faster; and then the thin layer of dry soil would prevent evaporation and the drying out of the deeper soil.

By Mr. Wright:

Q. Do you use a light harrow?

A. A light harrow with teeth sloping backwards; or better still, a weeder with teeth or fingers which pull out the weeds but not the grain.

Q. I use almost any kind of harrow on my farm.

A. Yes, so long as it does the work properly.

By the Chairman:

Q. The application of that principle in the North-west, especially about Indian Head, has practically solved a serious problem in that district; where wheat raising

was a failure we now have a success, due entirely to the adoption of this principle of rolling and harrowing after.

ILLUSTRATION COOL CURING ROOMS.

Since cool curing is desirable for cheese and gives the result in quality which the market wants, the question we have to ask ourselves is what means should be adopted to get it in the cheapest and best way. The sub-earth air duct has been recommended; it lets the air into the curing room through a duct underground and allows it to be cooled by passing through tiles in the earth. I had ducts like that in operation twenty years ago, in 1883. But few of the 3,000 odd cheese factories in Canada used any agent or appliance for the cooling of the curing rooms.

The use of a cement floor sunken in the ground is another method of using the cooling power of the earth; the whole floor becomes a cooling agent. As far back as 1885 I used stone walls and cement floors for curing rooms, and these gave a large extent of cooling surface; but the appearance of mould on the cheese prevented their usefulness. It is only of late years that the means have been discovered to prevent mould by the use of formalin and of paraffin wax to keep the surface or rind of the cheese clean. With these we can follow the practice of having stone walls and cement floors sunken in the ground as cooling agents, and so can use this large surface of stone and cement without much expense. The use of these must become general in this Dominion; and I shall speak a little later of the value of cement floors for cow stables. The want of cement floors to keep the stables warm in winter has prevented the success and extension of winter dairying. When we have cement floors generally we shall have a large expansion of winter dairying in Canada.

By the authority of the Minister of Agriculture it was decided to establish four experimental and illustration cool-curing rooms in Canada. In Ontario one was established at Brockville, which has the largest cheese board of any in Canada I think; another at Woodstock, a large railway and market centre for cheese in western Ontario. In Quebec we have them at Cowansville, the largest cheese board and market of Quebec, and at St. Hyacinthe, in the heart of the French-speaking country, where dairying is followed. These four centres were chosen and buildings were put up, properly insulated and constructed so as to be object lessons. The capacity of each was 2,700 boxes of cheese on the shelves. We took in cheese from surrounding factories from the first of July to the end of September, altogether 26,531 boxes of cheese, from 37 cheese factories. The salesmen controlled the cheese themselves and sold them as they liked. We did not own the cheese as a department and had no control over them or their manufacture. We had simply charge of the curing of them, and charged the factories only the value of the difference between the shrinkage of weight of cool-cured cheese and cheese cured in the ordinary way. That was the only revenue we had, and it was for the last year \$3,139.04. The saving in shrinkage of weight was 31,403 pounds on the 26,531 boxes of cheese which we handled. Mr. Ruddick, chief of the dairy division, gives, in a report, details of the shrinkage, the methods of management and the practical part of the work generally. As I think the members of this Committee would be glad to see that incorporated as part of my evidence, I will, with your permission, put it in as an appendix to to-day's evidence.

By Mr. Cochrane:

Q. Could that be applied to ordinary factories?

A. Yes; I will speak in a moment about its being applied in ordinary factories. In our work we put aside from every factory once a week, or oftener, two cheese from the same batch ('batch' is the term used to designate all the cheese from one vat of milk); so that the cheese were exactly alike in quality before the curing process began. In every instance one of these cheese was put in the cool-curing room and the other, its mate, in the ordinary curing room. We had altogether 450 pairs of cheese like

that. We had them examined by cheese makers, by merchants from Montreal and elsewhere, by myself and by experts; and in no single case was the cheese cured in the warm ordinary curing rooms as good in quality, as good in flavour or body, as its mate which was cured in the cool-curing rooms. Of these 450 pairs examined last year, in nearly every case these cool-cured cheese were decidedly better than their mates cured in the ordinary way. These cheese were made by ordinary cheese makers in ordinary factories, and in every instance the results in quality were substantially better from the cool-curing rooms than by the ordinary method. Mr. Ruddick's paper gives the details of the difference in temperatures.

Q. What is the difference in the time of curing?

A. About a week longer in the cool room to bring the cheese to what is called the breakdown stage; not more than that, at a temperature between 54° and 58°, as against a temperature ranging from 60° to 80° in the ordinary curing rooms. Out of these four cool-curing rooms there were sold 500 lots of cheese by the salesmen, week by week. Last season was a particularly favourable year for cheese-making, but I heard of only four lots that were complained of by the buyers as being at all inferior; and the inferior quality was not due to the curing of the cheese, but arose from other causes. These cheese were sent to England through the usual channels of commerce, and the English salesmen said that the cool-cured cheese were substantially better and sold for higher prices than lots cured under the ordinary conditions. We followed up some of the different lots to the other side, to the English markets. We had only one little slip that I want to explain. We were late in the season in being ready to start the cool-curing rooms, and some of the cheese got a little mouldy before we could correct it; and some of our patrons thought that was going to do a lot of harm. At St. Hyacinthe, where we had more moulded than usual, owing to the lumber being perhaps a little green and the floor not quite dry, the cheese buyers who bought the cheese one week docked the price of the cheese on delivery half a cent a pound. The cheese buyer of course will take every chance he gets to dock the price of the cheese; that is his business. I do not say it is dishonest; the buyer evidently counts it a legitimate part of his business in buying cheese to dock the price if he can. But in the case of those St. Hyacinthe cheese which were slightly moulded it was unfair docking; the buyers took an unfair advantage of the salesman. The reason I say that is because I had a man go to the warehouses in Montreal the next day and try to get these cheese back at the full price for which they were first purchased, and the buyers would not give them up. We got hold of one lot that was docked; it afterwards brought the full price of finest cheese. It was made in July; and the cheese were sold in Glasgow in December, for a price equal to September cheese—63 shillings per cwt.; and they were bought at first from the salesman at St. Hyacinthe at 9½ cents. I cannot make it too plain, that this little trick of getting after the cheese makers and upon unwarranted pretexts docking the price of cheese has done the trade much harm. As far as we could manage it we stopped it last year. The statement I have made shows the result in one instance.

By Mr. Cochrane:

Q. Where was your government inspector? Have you not a government inspector?

A. We had an official referee at Montreal, but this salesman at St. Hyacinthe accepted the buyer's statement of conditions before he knew all the circumstances. I can only give the Committee one or two words more on this subject. We have been striving also to have the cheese sent from Canada boxed in better boxes, so as to be delivered in England with fewer breakages. Part of the expenses at the illustration cool-curing rooms was due to the fact that we paid more for cheese boxes than the ordinary prices. Our patrons objected to paying more than the usual figure for the ordinary cheese boxes, so the difference was charged to our department. We paid \$501 more for boxes last year, which represents the difference between what the extra

strong boxes cost us and what the factories paid us. That is also an object lesson and it has had the effect of bringing about a general desire for better boxes, in order that our cheese may be landed in England in better condition.

By Mr. McEwen:

Q. What do these cheese boxes cost?

A. They cost us 15 cents each in some cases; and this year we are going to use a still stronger box, to see if it produces still better results, because the additional cost of the box is a mere bagatelle in comparison with probably two shillings more per cwt. on the other side for the cheese. We found in some cases that as many as 40 per cent of the cheese boxes ex some cargoes at Bristol were broken when taken out of the ship, in large cargoes of over 7,000 boxes each.

The average cost of running these four illustration curing rooms, including those things I have told you, was \$1,862 each; that was for maintenance for the year; and that includes all the educational work we are doing this winter by the four superintendents travelling around attending the farmers' meetings.

By Mr. Cochrane:

Q. That was the cost of maintenance, but not of the building?

A. Yes, that was the cost of maintenance. In Canada we make practically three-fourths of the cheese in June, July and August, that is during the hot weather months. If we get all these cheese cured at a low temperature, we can put on the market in July, August and September, not a whole lot of hot flavoured and ill conditioned cheese, which act like a drag on the market, but good quality of mild cheese. We can give the English consumer a cheese which he wants and a cheese for which, if we keep up the quality, there will be a demand that will keep pace with any possible production during the next ten years. We can always find a safe market if we give to the consumer the article he wants; and, as I have shown you, the cost of obtaining this excellence from cool-curing is not very great.

By Mr. Kendall:

Q. A few years ago it was said that we had, comparatively speaking, reached the limit of our cheese sales in Great Britain. What do you say about that?

A. I have heard that statement made for the last fifteen years, that we were near the limit of our profitable production, so far as the market was concerned; and yet last year we sent out \$20,000,000 worth of cheese and the market prices were seldom if ever better than they were then. It is a question of quality; the English consumer will eat almost any quantity of a dainty thing if he can get it, in good condition; and if we can keep our cheese up in quality on the average to that of our cool-cured cheese, we can, I believe, double our exports in the next twenty years and still have a profitable market price.

By Mr. Ross (Ontario):

Q. How do you arrive at the total production?

A. We take these figures of exports from the returns of the Trade and Commerce Department, which published the returns of exports, and we add a little for home consumption. The figures I have quoted from the provinces of Quebec and Ontario were taken from the census. The cool-curing of cheese may become common at individual cheese factories; quite common. There are many places in Canada where the consolidation of curing rooms is not practicable. There are perhaps forty centres, taking Canada as a whole, where the consolidated curing room will be the most effective and cheapest way. We will have two methods—one the improvement of the curing rooms at the individual factories; and the other the centralized curing rooms, each serving a number of factories. Both methods—the improvement of the individual curing

rooms and the establishment of consolidated cool-curing rooms, or modifications and combinations of both—will bring benefits to all concerned; the patrons by getting more for their milk; the cheese makers by having less risk of loss and trouble with their product; the cheese buyers by having a safer article to handle; and the consumers by getting a more wholesome and better article of food. There is a practice that has come out of this also; that is the practice which is now practicable, of coating the cheese with paraffin wax in order to prevent mould and shrinkage in weight. We tested the practice on cheese cured at the ordinary atmospheric temperature and found that it cannot be done with advantage on cheese cured above 65° or 70°, because the cheese take on an unsightly appearance; but where cured at a low temperature, the use of paraffin wax as a thin coating all around saved a large amount of shrinkage in weight. Cheese paraffined in August and September had not lost any weight when shipped in February, as against a loss of 2½ pounds per box in cheese under ordinary conditions, not paraffined.

By Mr. Ross (Ontario):

Q. What is the cost of paraffining?

A. Perhaps two cents per cheese of about 70 pounds; it does not require more than two ounces of paraffin.

By Mr. Cochrane:

Q. Could you give me an idea of the cost of hauling the cheese from the factories, within a radius from Brockville cool-curing room?

A. The whole cost of hauling cheese from the factories to the cool-curing room at Brockville last year was \$702. We hired teams to bring the cheese in regularly and the cost was \$702. As a matter of fact, cheese has to be taken to a railway station some time; and if there is to be delivery by the patrons themselves, the cheese may as well be delivered when it is two days old as when it is two weeks old.

By Mr. Kidd:

Q. Are these curing stations to be open this summer?

A. We established them with the intention of keeping them open under departmental control three years.

By Mr. Cochrane:

Q. In connection with the cool-curing room, is it necessary to have the walls of the basement of stone?

A. It is an advantage to have the floor anywhere from 2½ to 3½ feet under ground, to get the full value of the cooling power of the earth at that depth. You need stone walls a little above the ground and above that an insulated wooden wall. Wooden shavings are more satisfactory than sawdust as insulating material.

Q. The shavings are the best you say?

A. Yes.

By Mr. Wright:

Q. You said something about cement cellars in stables; is that embodied there or shall we lose it?

A. I shall refer to it again.

By Mr. Sproule:

Q. You say that covering with paraffin prevents shrinkage and waste? Would you mean that that is due to its imperviousness?

A. That is the main reason for using it in the curing of the cheese. We went so far in experimenting on this line, that we had some new cheese put in tin cases and

sealed up hermetically. They were kept sealed for months and it was found that these cheese were as well cured as those which were not encased. There was no difference in the curing when the cheese was covered as imperviously as tin or paraffin would make the covering.

By Mr. Kidd:

Q. Does it cure as well as in the box on the shelves?

A. Unless one is quite careful to have a dry, well-seasoned box we find the odour of the elm wood penetrates the cheese.

IMPROVED TRANSPORTATION FACILITIES.

Let me now speak of what the department is doing to help in the safe transportation of cheese and butter. There are many difficulties in getting perishable products from our country to the British market, because of distance, because of deterioration from high temperatures and because sometimes of rather high charges. These are the three difficulties, distance, deterioration from unfavourable temperatures, and high charges. Now three things seem desirable in transportation, safety, which comes foremost, regularity and reasonable rates. I think in Canada we have obtained a transportation service which includes all these three as applied to cheese and butter, safety, regularity and reasonable rates. It costs very little more to take cheese from any town in Ontario or Quebec on a main line of railway, to London, England, than to take it from my own native county of Ayr, in Scotland, hardly any more.

By Mr. Ross (Ontario):

Q. Ayr, in Scotland?

A. Yes. The rates on Canadian railways and on steamships are reasonably fair.

Q. How far is it from Ayr to London?

A. About 400 miles.

Q. And 3,000 from Toronto?

A. Yes, about 3,500.

Q. And you say the freight is practically the same?

A. About the same.

By Mr. Cochrane:

Q. How do the rates charged from American points across the Atlantic compare with the rates on the Canadian lines?

A. Ours from Canadian ports are usually a little higher on cheese than from Boston or New York.

By Mr. Kendall:

Q. Is it not complained by the farmers in Scotland and England that the railway rates are almost prohibitive?

A. Quite too high. We have striven to get cold storage at creameries by publishing plans and offering a bonus, which is still available, to the extent of \$100 per creamery, under three conditions, (1) that the cold storage shall be properly constructed (2) that the factory shall turn out a certain amount of butter, and (3) that the cold storage shall be maintained at a suitable temperature. The bonus is not paid unless these conditions are complied with: (1) construction, (2) quantity of butter, and (3) maintenance of cold storage. A good many butter makers were dissatisfied last year because they did not get the second or third payment of the bonus. That was because they made cheese, but if they make butter this year and comply with the conditions, they will get the bonus.

By Mr. Ross (Ontario):

Q. Do you know the rates from Ontario points to London on cheese?

A. I am not sure of the present rates. It has been anywhere from 40 shillings up to 55 shillings a ton.

Q. A ton?

A. A ton, yes. That would be about 2 shillings a hundred weight, 50 cents a hundred weight.

By Mr. Kidd:

Q. That is the winter rate?

A. The winter rate, yes. I have known the rate to be as low as a quarter of a cent a pound. I have shipped for that right to London.

Q. 26 shillings is the rate very often. That was the rate a year ago, last summer.

A. That was when the rates were low. That would be about a quarter of a cent a pound.

Q. Yes, a shade over a quarter of a cent.

A. On the railways, provision has been made for running cold storage cars in a large way, from 42 points once a week to Montreal and from six points once a fortnight. We guarantee that the railway companies will earn by each car per trip two-thirds of a carload rate from the starting point. Many of the cars pay their way, but on some of the routes they do not, because the trade is not developed yet; that is why the yearly payments by the government have not become less, because when one route becomes self-sustaining, new routes are started.

We have had three inspectors doing missionary work in that connection; the main business of one of them is to visit the railway agents and educate them on the meaning, uses and application of cold storage. It was quite a common thing for a cold storage car to come to a station and be left with the doors open for half an hour. Then too a farmer will sometimes bring in butter and leave it on the station platform, in the sun. That is from ignorance of course; but the butter is damaged and goes into the car heated and damages some one else's butter. We have been trying to remedy that by giving information and counsel.

We have an inspector at Montreal who examines the cars to see how they come in, and to see that the railways do their duty. He examined last year 629 carloads of butter. He could not examine all that came in, but he examined that many, and reported on their condition. Then in special cases he put a thermometer into the butter to find whether it was cold when it started on its journey or not, and if it was not, he got after the creamery man who tried to make the car a cold storage room to cool his butter, instead of using it to keep it cold. Sometimes he found the butter colder near the surface than at 2 or 3 inches deep, which showed that the car had cooled it from the time it was shipped. We are following up this to get the butter shipped in a proper state.

By Mr. Sproule:

Q. Are the great bulk of the cars kept under proper cold storage?

A. Not more than perhaps ten cars out of the 629 were last year reported as being without ice or in bad condition on their arrival at Montreal. An intimation to the men in charge has usually brought about any necessary change.

By Mr. Robinson (Elgin):

Q. Is the butter packed in square boxes?

A. In boxes of 56 pounds each.

Then we also took up with the railway people the matter of getting better cars and better car service for cheese. Sometimes a refrigerator car is used for carrying cheese. Now, a refrigerator car *without ice* does not give nearly as good service as a common box car. The closed refrigerator car without ice catches the heat of the sun and gets warm inside. We got the railway companies to build some specially insulated

and ventilated cars to carry cheese and apples safely. I am told that the Grand Trunk is building 100 of these for its own use this year, the ten built last year at the request of the department doing so well. Now I think we are well served with cold and cool storage on the railway lines.

This brings me to the subject of cold storage on the ocean steamers. Last year there were 250 sailings of steamers from Montreal with food products, and of these 127 sailings had cold storage. That is quite a notable growth, since not a single steamer carrying food products from Montreal in 1894 had any cold storage at all. We placed on these steamers 148 thermographs. This is a little instrument which registers the temperature continuously. We have the charts from them come back showing us what the record of temperature for the whole voyage was. That chart of which I have several here, lies around a drum driven by clock work. It takes 14 days to turn round once, and as it moves, a little pen point traces a line which shows the temperature continuously day by day. Here is one taken from the *Hurona*, which left Montreal on August 21 last, and that is the record of temperature where butter was stowed. In that case it was from 29 to 31 degrees Fahr. We do no trust to the engineer's report; this is an automatic register. We are getting a number more of these thermographs and putting them in different parts of the ships.

By Mr. Ross (Ontario):

Q. Can any one tamper with those?

A. They are closed and locked at Montreal by one of our inspectors.

Q. And opened at the other end?

A. Opened on the other side by our inspectors. The charts are endorsed by our inspectors with their name, as you will see, and come back to us. They cannot be tampered with. We found the cold storage was bad in a few instances and sent the charts to the steamship agents for their information. They replied that it should not happen again. It removes the element of doubt, often a cause of trouble between shippers and the steamship company when they have to rely only on a record of temperatures taken by a ship's officer.

By Mr. Stephens:

Q. Was there much difference between the proper temperature and what it should be in those cases you mention?

A. One chart gave a reading of 51 degrees Fahr.

By Mr. Sproule:

Q. You say there were 250 sailings last year, out of which 120 had cold storage.

A. There were 127 sailings with cold storage from Montreal. We have three inspectors at the port of Montreal to watch the loading of food stuffs, to see they are stowed in a proper way, and to report on breakages. They reported on 250 sailings of steamers with food stuffs last year.

By Mr. Cochran:

Q. What do we understand by that cold storage system?

A. It is all mechanical refrigeration put in by different firms who manufacture and install refrigerating machinery. There is also cool storage on ten steamers, provided by mechanical refrigeration and the circulation of cooled air through the compartments where cheese or apples are stowed; that is apart from these 127 sailings with cold storage. We are now trying to get the steamship people to keep the cold storage for butter at 25 degrees and under, and the cool storage for cheese and apples under 60 degrees continuously; the one—the cold storage—for butter, and the other—the cooled air in circulation—for cheese and apples. Nearly every summer there have been complaints from the fruit trade on the lack of cool—cooled air—storage on steamers.

By Mr. Sproule:

Q. What is the experience of sending fruit last year?

A. The department did not send any. Apples, except the very early tender varieties, do not require more than ordinary cool storage, but pears do need cold storage. Shippers sent a good many pears last year with success, all in cold storage.

By Mr. Robinson (Elgin):

Q. Was there any report made of some shipments spoiling?

A. There were four or five.

Q. Why was it?

A. In one case the inspector reported that they were over-ripe at Montreal, so that in that case it was the shipper who was to blame. I think, perhaps, Mr. Chairman, the Committee would like to have Mr. Mackinnon, chief of the fruit division, here to be examined specially on that matter. He spent ten months in Great Britain last year, and is thoroughly familiar with this whole fruit question.

By Mr. Kendall:

Q. Do you advise 25 degrees for meat?

A. Chilled meat should be kept at 29 degrees.

Q. Cold storage for butter is 25 degrees?

A. Yes, and as much lower as practicable.

Q. And for meat?

A. There is a good deal of frozen meat shipped in cold storage; as a rule frozen pork, which should be kept under 20 degrees.

THE PREVENTION OF MOULD.

I wanted to say a word about one other matter, that is, the trouble that has come to the country from the appearance of mould on butter. That is not due to any fault in the butter itself; but occurs first on the paper with which the boxes are lined. The butter paper or the butter boxes become covered with spores of mould. Mould is a plant, small in size, that comes from spores, which serve the same function as seed. I will give you an instance of its prevention. Mould was common on the butter shipped from the North-west creameries in 1897. Then we adopted the practice of soaking the paper in which it was packed in a brine made of salt and formalin. Since then we have had no mould on the butter from that district. We have been publishing the details of that to every creamery. Yet this is from one of the leading butter makers: He said to me last year, 'I have followed your prescription for preparing the paper and still the butter was condemned as being mouldy.' I asked him, 'What did you do?' He answered, 'We took the butter papers and soaked them in brine and after they were soaked we hung them up in the creamery to dry. When they were dry we put them in the butter boxes, and still the butter was mouldy.' There it is you see—sterilizing the paper first by soaking it in the formalin water, and then undoing everything by hanging it up to dry, letting it be exposed to infection of spores after sterilization. That is where the services of the travelling instructors are always valuable. They can give information upon all these points and prevent these mistakes being made. If that practice of soaking the butter paper in brine, with one ounce of formalin in every gallon, was general, the appearance of mould would entirely cease.

By Mr. Kendall:

Q. Did you ever try boracic acid, and is it effective?

A. It does not prevent mould. We always put two thicknesses of paper in the butter boxes.

Q. Does the odour of the formalin affect the butter?

A. The odour of the formalin does not injure the butter at all; it is merely used for killing the mould on the paper and boxes, and is not put in or on the butter.

By Mr. Cochrane:

Q. Is this preparation readily applied?

A. Yes, it is readily applied and not at all costly.

VALUE OF CO-OPERATIVE TESTING ASSOCIATIONS.

If I may take another ten minutes, I would like to take another side of this dairy business. I have been speaking mainly on the particular part of dairying that is associated with the manufacturing of the product and with the transportation of the article. I have said nothing about the production of milk. That in itself is a theme, an important theme, and, of course, a large one. I would like to lay emphasis on two points for the benefit of this Committee. There has been hardly any attention in Canada paid by the general farmer to the systematic breeding of dairy cows. There has been a lot of talk about thoroughbreds, and people have been bolstering up names, by lists of prizes at shows and such like, and others have been led by the use of these names into doing things that do not pay. Let me give you an instance of a more excellent way. Over in Denmark—where they have had, I think, the best common school system in the world, a common school education which has done a great deal for the benefit of the farmers—they have formed small co-operative testing associations among the farmers for a definite purpose. These small co-operative testing associations have been striving to do four things. First of all let me tell you what one of these small co-operative associations is like. Often they are limited in membership to twelve men in the locality. Three directors are appointed by the association, and of these, one retires every year, so that each holds office for three years. They undertake to do four things for themselves, and by themselves, with some government help in the form of a grant of a little money to help to pay expenses. They first of all undertake to find out how much is the cost for feed per cow in their own herds, by once in a while getting, by weight or measure and calculation, a rough business estimate of the cost of food per cow or per herd. Then they have the milk of each cow weighed once a week; this is not done every day, because to do so would involve too much labour. Then the milk is tested as to quality often enough in the season to show what percentage of fat is applicable for the whole year, say once a fortnight or once a month. That is quite close enough for practical purposes. Then they make a statement showing the relation of the cost of the feed consumed to the value of the product. We do not do that in Canada, except perhaps in one herd in a thousand, and it is a mistake that we do not. Nobody can run any business successfully unless he keeps books or unless he knows the relation of the cost of production to the price received for the product. Let me give you one instance of what they have done in Denmark by one of these testing associations. They have now over 250 of these testing associations in that kingdom. Here is the result of a typical one for the last three years: The increased yield of milk per cow in their herds from 1899 to 1902, was an average of 942 pounds of milk per cow, per annum, being an increase of 18 per cent in that period. The yield was increased from 5,162 pounds of milk per cow in 1899-1900, to 6,104 pounds of milk per cow in 1901-1902. There was an increase in butter of 47 pounds per cow, or 24 per cent in the three years. These are marvellous results to be attained in three years, especially when we find that meanwhile there was a reduction in the cost of food, by the farmers learning the effects, the best value to be found from the feed and the best way of balancing the rations. If you can get both an increase in the quantity of milk per cow and an improvement in the quality, as they have in the case I have cited, and at the same time effect a reduction in the cost of production, you are on the right lines for a tremendous increase in the profits of the business. That is what they are doing in Denmark.

By Mr. Sproule:

Q. Is it a fact that suitable food will increase butter fat and also increase the quantity of milk, at the same time reducing the cost of the feed?

A. The result of their observations has been to show that it has increased the yield of milk per cow, and wherever they have increased the yield of milk, they have also increased the percentage of butter fat. I know it has been the common impression that the contrary was the case, but the records show that the percentage of fat in the milk has been increased as well as the quantity of milk per cow.

By Mr. McEwen:

Q. How do you account for that?

A. I attribute the reduction in the cost of food to better management; and the increase in the yield of milk to that also; including intelligent selection and breeding of the herds.

By Mr. Cochrane:

Q. Did the reduction in cost of food decrease the percentage of fat?

A. It did not decrease the percentage of fat. There was an actual increase in the percentage on the average of all these cows.

By Mr. Cochrane:

Q. Is it in the food that the increased production of butter fat was caused, or in the cow?

Q. As a matter of fact, whatever increases the milk production seems to increase the percentage of fat.

Q. In the same quantity?

A. It increases the percentage of fat as well as the quantity of milk, but as a matter of fact the giving of milk of a very rich or a very poor quality in the percentage of fat is largely a matter of constitution with a cow, and may arise from some other fact or set of facts than because it is of a certain breed.

A COW CENSUS IN WISCONSIN AND ITS LESSONS.

I desire to present some facts brought to light in a most striking way by an investigation conducted by Mr. C. P. Goodrich, of Wisconsin. I am indebted to *Hoard's Dairyman* for the information contained in a paper read by Mr. Goodrich before the convention of the Wisconsin Dairymen's Association at Fond du Lac, on February 11, of this year. As the time now at my disposal this morning is short, I shall submit to you the points which impressed me most in Mr. Goodrich's most excellent paper, substantially in his own words:—

'At the request of the President and Secretary of the Wisconsin Dairymen's Association, I came to Fond du Lac county last November to gather statistics from creamery and cheese factory patrons in relation to the dairy business, as it had been carried on here for the twelve months preceding October 1, 1902, with a view to presenting the results of my investigations to this meeting. I was well aware that here, as elsewhere, some men were carrying on the business at a good profit, and others at a loss, or, at best, getting very small pay for the work connected with it. I hope to be able to present the facts and figures, which I have gathered, in such a way—contrasting the methods of the most successful with those who have been less successful—as to enable those who have been working for nearly nothing, feeding and caring for cows, to do better in the future, by following the methods of those who have been making good profit.

'THE SCOPE OF THE INQUIRY.

'I visited 48 creamery patrons and 12 cheese factory patrons. I ascertained the average number of cows each had kept during the year, including the whole number, as well when they were dry as when giving milk, because they were eating all the time

in either case, and counting heifers, after having their first calves, as full cows; the kind of cows and the kinds and amounts of the different feeds given the cows, and estimated the value of the same.

HOW COST OF FEED WAS OBTAINED.

'I charged the cows for the feed raised on the farm the market price for which it could have been sold at the time, and for that which was purchased, the market price at the time it was fed. The prices I fixed on feeds are as follows: Timothy hay \$12 a ton; other kinds of hay \$8; corn stover \$3, and ensilage \$2.50. Pasture I fixed at the uniform price of \$5 a head for the season. Oats were \$28 a ton; corn, \$21; bran averaged \$19.50; gluten feed, \$24; malt sprouts, \$18.50; and oil meal, \$30.

'I assumed that each cow consumed of roughage during the winter two tons of hay, or its equivalent. In the case of corn stover I figured that, as a rule, only about half its weight was eaten, as the thick, hard stalks and some of the rest was refused by the cows or trodden under foot and wasted. Therefore, when all the roughage a cow had during the winter was corn stover I calculated it took four tons, or \$12 worth. If half of her roughage was corn stover I charged her six dollars for it.

'I had some difficulty in finding out the amount of grain feed each man fed. Some men, it is true, could tell me the exact amount of feed they had bought or had ground; then it was easy. Some could only tell by measure; then my experience in measuring and weighing feeds would enable me to estimate the amount in pounds. Some, who fed shock corn, could only tell the number of acres fed. In such cases I had to make an estimate from that.

'I do not claim that I have got the cost of feed of cows in every herd exactly right. From the nature of the case that would be impossible, but I believe that I have approximated pretty closely to it.

QUANTITY AND VALUE OF PRODUCT.

'After getting all these facts from the patrons, I obtained from the creamery and the cheese factory the amount of milk delivered by each patron, the amount of product and the amount of money received for each of these 12 months. From these data I was able to figure out the average per cow, of milk, of product and of money per cow, together with the prices obtained and the profit or lack of profit per cow in each patron's herd.

WHY PRICES FOR BUTTER DIFFER.

'It will be observed that some patrons received a higher price per pound for butter than some other patrons did. This is owing to the fact that those who received the higher prices produced a larger portion of their milk during the winter months when the price of butter was the highest. The price of milk also varied, not only for this reason, but also on account of the difference in the percentage of fat it contained.

'These facts and figures I have arranged in as convenient a form as I could devise, in the following table. The names of these patrons are not given. They are represented by numbers. I made a promise to that effect, when seeking the information, to each patron and also to the proprietors of the factories.

Cost of Feed and Income in 48 Herds Belonging to Patrons of Creameries in Fond du Lac County, for the 12 Months Ending September 30, 1902.

Patron's Number.	No. of Cows.	Kinds of Cows.	Cost of feed per cow.		Returns for butter from creamery per cow.		Net profit or loss from butter per cow over cost of feed.	
			\$	cts.	\$	cts.	\$	cts.
1	14	Grade Jerseys and grade Guernseys	42	00	57	89	15	89
2	21	Guernseys, $\frac{1}{4}$ bloods	31	00	29	26	-1	74
3	13	Grades, Durhams and Holsteins	25	00	33	17	8	17
4	25	Grade Guernseys and grade Jerseys	28	00	57	18	29	18
5	8	High grade Short-horns	28	00	37	81	9	81
6	11	Grade Jerseys	30	00	31	54	1	54
7	12	Grade Guernseys and grade Jerseys	30	00	44	05	14	05
8	10	Grade Guernseys and grade Jerseys	34	00	35	03	1	03
9	8	Grade Short-horns	34	00	33	06	-0	94
10	20	Grade Jerseys	38	00	41	40	3	40
11	9	Grade Jerseys	24	00	36	64	12	64
12	7	Grade Durhams	29	00	27	95	-1	05
13	11	Grade Jerseys, 2 grade Durhams	22	00	29	78	7	78
14	13	Grade Holsteins and grade Jerseys	30	00	22	67	-7	33
15	12	Grade Holsteins and grade Jerseys	27	00	28	61	1	61
16	15	Grade Short-horns	24	50	34	46	9	96
17	18	Holsteins and grade Jerseys	30	50	43	19	12	69
18	17	Grade Guernseys	31	00	36	80	5	80
19	10	Grade Holsteins and Durhams	22	00	32	95	10	95
20	5	Grade Jerseys	27	00	48	79	21	79
21	22	Holsteins and Holstein grades	25	00	45	17	20	17
22	10	Grades of different dairy breeds	38	00	42	23	4	23
23	23	Grade Durhams, some grade Holsteins and Jerseys	28	00	31	16	3	16
24	25	Grade Jerseys and grade Short-horns	32	00	34	31	2	31
25	16	Holsteins	40	00	67	79	27	79
26	17	Short-horns and some Jerseys and Holstein grades	34	50	24	33	-10	17
27	14	Grade Holsteins	31	50	31	28	-0	22
28	7	1 grade Holstein, 2 grade Jerseys, balance common cows	40	00	45	39	5	39
29	10	Grade Holsteins	33	00	37	11	4	11
30	8	Common cows	30	00	33	06	3	06
31	18	Common stock	24	00	34	22	10	22
32	10	Common cows with a little Jersey blood	23	00	24	98	1	98
33	15	Common cows	25	00	33	41	8	41
34	7	2 grade Jerseys, balance grade Durhams	28	00	40	23	12	23
35	10	Grade Jerseys and grade Short-horns	36	50	44	91	8	41
36	10	Grade Short-horns	30	00	28	57	-1	43
37	10	Grade Durhams	31	00	26	49	-4	51
38	11	Jerseys and grade Jerseys	27	00	39	18	12	18
39	12	Common cows	30	00	27	34	-2	66
40	15	Mostly grade Short-horns	27	00	41	06	14	06
41	9	2 gr. Guernseys, 2 gr. Holsteins, rest grade Short-horns	32	00	35	34	3	34
42	20	Grade Guernseys, grade Jerseys and grade Holsteins	30	00	31	25	1	25
43	10	Grade Jerseys and grade Short-horns	20	00	28	66	8	66
44	13	Grade Short-horns	35	00	35	40	0	40
45	14	Grade Red Polls and grade Short-horn, 2 grade Jerseys	32	00	32	80	0	80
46	13	Grade Durhams and common stock	26	00	30	53	4	53
47	12	Grade Durhams	31	00	28	46	-2	54
48	7	Common cows	28	00	37	27	9	27

'AVERAGES FROM THE CREAMERIES.

'The 48 creamery patrons had 637 cows. By averaging the whole, we find the average cost of feed per cow to have been \$29.88; average returns for butter from creamery, per cow, \$35.82; average pounds of milk, per cow, 4,204; average pounds of butter, 185; average net price of butter per pound to patron, 19 $\frac{27}{100}$ cents; average price

of milk per 100 pounds, 85'2 cents; average value of butter for one dollar's worth of feed, \$1.20; average net profit from butter per cow, over cost of feed, \$1.94. Now, if we add 2¢ cents a hundred to the value of the milk as the value of the skim milk (and with the high price of all kinds of feed, last year, it was surely worth that) that would make \$8.20 more, making an average profit per cow of \$14.34. This is not so bad, after all, and shows there was a fairly good profit for the Fond du Lac dairyman even last year, when the high price of feed had cut down the yield and the profits below what they had been in previous years.

'And still I have not counted all that the patrons received from their cows. There were the calves; the whole milk used in the family; the whole milk fed to the calves; and the manure to keep up the fertility of the farm. These last items varied considerably on the different farms, but as it would have been impossible to arrive at anything like a just estimate of their value, I have left them out entirely. It is true that some patrons used more whole milk in their families, and fed more to calves than others, still it is not likely there would be more than two dollars' difference per cow in extreme cases. Yet these last mentioned items, when all put together, would help to a considerable extent, to pay for the labour in caring for the cows.

'I have selected a few numbers, some of the best and some of the poorest, and will now go into the particulars of what I learned concerning them, and see if we can discover the cause of the great difference.

'ONE MAKES A PROFIT AND ANOTHER A LOSS.

'No. 1—Had 14 cows, grade Guernseys and grade Jerseys, fresh in spring and winter; cost of feed was \$42 per cow for the year; returns from creamery for butter per cow, \$57.89; pounds of milk per cow, 5,488; pounds of butter per cow, 300; average price of butter per pound, 19 cents; average price of milk per 100 pounds, \$1.05; value of butter for one dollar's worth feed \$1.38; value of butter per cow over cost of feed, \$15.89. Average ration: bran, ground oats and corn, 13 pounds to fresh milkers, shredded corn stover, and for two months in spring timothy hay; run to straw stack; in summer pasture only. Adding 20 cents per 100 pounds, for skim milk, would make profits per cow \$26.87.

'No. 2—21 cows, quarter-blood Guernseys, fresh all the times; cost of feed, \$31; returns from creamery, \$29.26; pounds of milk, 3,361; pounds of butter, 155; price of butter, 18'9 cents; price of milk, 87 cents; for one dollar in feed, 97 cents; value of butter per cow, less than cost of feed, \$1.74. Ration: bran and middlings 4 tons, which would make less than two pounds per day during winter; 4 acres, heavy crop, well eared sweet corn, and timothy hay; in summer, pasture only. If value of skim milk is added, his profits would be \$4.98 per cow.

'Now, can we see what made the difference in results between these two men? It is no doubt partly owing to the difference in the kind of cows—quarter-blood Guernseys may have been the product of a half-blood sire, or a cross of something with half-blood Guernsey dams—but mainly to the feed.

'No. 1 fed a fairly well balanced ration. He fed high; believed in feeding well, let it cost what it would, so he told me. His feed was very expensive, yet he made a good profit.

'No. 2 fed a very carbonaceous ration, did not believe in buying feed, but in feeding what he could raise on the farm, whether it made a well balanced ration or not.

'THE BANNER HERD.

'No. 4—25 cows, grade Guernseys and grade Jerseys, fresh at all times; cost of feed, \$28.00; returns from creamery, \$57.18; pounds of milk, 5 809; pounds of butter, 298; price of butter, 19'2 cents; price of milk, 98'4 cents; for one dollar in feed, \$2.04;

net profit of butter over cost of feed, \$29.18 per cow. Ration: bran and malt sprouts, 6 pounds; well eared ensilage, 30 pounds; straw; fodder corn in fall; in summer pasture only. Adding value of skim milk makes profit \$40.80 per cow.

'SAME KIND OF COWS BUT LESS PROFIT.

'No. 7—12 cows, grade Guernseys and grade Jerseys, most of them fresh in October and November; cost of feed, \$30.00; returns from creamery, \$44.05; pounds of milk, 4,201; pounds of butter, 220.3; price of butter, 20 cents; price of milk, \$1.05 per 100 pounds; for one dollar in feed, \$1.47; net profit of butter over cost of feed, \$14.05. Adding value of skim milk makes profit \$22.81. Ration: bran and some corn and oats, 4 pounds; ensilage, 35 pounds, a little oat hay; corn stover cut, wet, mixed and heated with ensilage; in summer pasture only, except a little in mangers to induce them to come in to be milked.

'A BEEFY TYPE HERD.

'No. 12—7 cows, grade Durhams of beefy type, fresh in winter and spring; cost of keeping, \$29.00; returns from creamery, \$27.95; pounds of milk, 3,266; pounds of butter, 152.2; price of butter, 18.4 cents; price of milk, 85.6 cents; for one dollar in feed, 96 cents; value of butter per cow less than cost of feed, \$1.05. Adding value of skim milk makes a profit of \$5.48 per cow. Ration: malt sprouts and ground oats, 6 pounds; corn stover, marsh hay and straw.

'It is plain to see why No. 12 did not get as good returns as No's 4 and 7. He fed fairly well, though not as well as 4 and 7 did, for they fed ensilage; but apparently the main reason is, he was giving his feed to cows of a beefy type, while theirs were cows of good dairy type.

'THREE GOOD HERDS, WELL MANAGED.

'No. 20—5 cows, grade Jerseys, good dairy type, 3 fresh in March, 2 fresh in September. Cost of feed, \$27.00; returns from creamery, \$48.79; pounds of milk, 4,375; pounds of butter, 245; price of butter, 19.9 cents; price of milk, \$1.11; for one dollar in feed, \$1.80; net profit of butter over cost of feed, \$21.79. Adding value of skim milk makes profit \$30.54 per cow. Ration: 2 tons bran to the five cows; shredded corn stover and timothy hay, ($\frac{1}{4}$ of roughage, hay); in summer pasture only.

'No. 21—22 cows, Holstein and Holstein grades, 4 or 5 fresh in fall, balance in winter and spring; cost of keeping, \$25; returns from creamery, \$45.17; pounds of milk, 6,016; pounds of butter, 231.6; price of butter, 19.4 cents; price of milk, 75.1 cents; for one dollar in feed, \$1.81; net profit of butter over cost of feed, \$20.17. Adding value of skim milk makes profit \$32.20. Ration: $1\frac{1}{2}$ pounds bran, 45 pounds ensilage, 8 pounds clover hay, and oat straw, all they will eat.

'No. 25—16 cows, Holstein thoroughbreds and very fine dairy type, most of them fresh in fall; cost of keeping, \$40; returns from creamery, \$67.79; pounds of milk, 8,396; pounds of butter, 333; price of butter, 20.3 cents; price of milk, 80.7 cents; for one dollar in feed, \$1.69; net profit of butter over cost of feed, \$27.79; adding value of skim milk makes profit \$44.58. Ration: 8 pounds bran, 40 pounds of well eared ensilage, hay and corn stover, all they would eat; in summer good pasture only. Cows kept in good barn and fastened in Drown stalls.

'COLD BARN NOT CONDUCTIVE TO PROFIT.

'No. 26—17 cows, Short-horns and Short-horn grades, a few with a little Jersey and Holstein blood, fresh one-half in fall, rest in spring. Stable cold, cows fastened with chains; cost of keeping, \$34.50; returns from creamery, \$24.33; pounds of milk, 3,182; pounds of butter, 133; price of butter, 18.3 cents; price of milk, 76.5 cents;

for one dollar in feed, 70 cents; value of butter per cow less than cost of feed, \$10.17; counting the skim milk at 20 cents a 100 pounds there is still a deficiency of \$3.81. Ration: bran, oats and corn ground, 8 pounds, marsh hay, a little timothy hay and fodder corn, not well eared. In summer, pasture and a little bran.

'What is the matter with No. 26? In the first place, his cows are not very good dairy cows; and secondly, and the main cause of his failure to get better returns, is his barn was so cold and his cows so uncomfortable that although half of them were fresh in the fall, they produced very little milk during the winter, as shown by the records of the creamery. He fed very well and quite expensively, but the cows had to use most of the feed to keep warm, and left but little for milk production. They gave most of their milk in summer on pasture, but even then they did not do very well, owing no doubt to the care they had in winter.

'ENSILAGE A FACTOR IN PROFITABLE DAIRYING.

'There are five creamery patrons who fed ensilage: No. 4, who made on butter \$29.18 profit per cow; No. 7, who made on butter \$14.05 profit per cow; No. 17, who made on butter \$12.69 profit per cow; No. 21, with \$20.17 profit per cow; and No. 25, with \$27.79 profit per cow. One cheese factory patron fed ensilage, No. 4, whose profit on milk delivered was \$22.23. These six silo men averaged \$21.02 profit per cow, while the average profit of creamery patrons was only \$5.94 per cow. The gross returns for the silo men averaged \$52.52 per cow, while those who did not feed ensilage received an average of but \$34.00 per cow, a difference of \$18.52 in favour of the ensilage men.

'Can any one doubt, in face of these facts, that it will pay to build a silo? Is it possible that all this gain in gross receipts and profits is because these men feed ensilage? Or, is it, in part, because these men are more progressive, up-to-date farmers, have better dairy cows, study to feed a balanced ration, and, in short, have less of old fogysm than many of those who do not have silos? These are questions for you to ponder on and answer.

'My own opinion is that, although I think any man is making a great mistake who keeps a herd of dairy cows without having a silo, the feeding of ensilage did not and could not, of itself, make this astonishing difference of over 54 per cent in gross receipts and more than 500 per cent in net profit.

'Prof. Voorhees, Director of the New Jersey Experiment Station, found that ensilage increased the amount of milk 12 per cent over dry feed of the same kind, when everything else was equal. Taking that statement as being the real difference in favour of ensilage, then in our case \$4.08 out of the \$18.52 gain per cow should be credited to ensilage and \$14.44 to "the man behind the cow."

'So I hope that none of you here who have had small returns per cow will entertain the idea that all you have to do, to get as large returns as these men who fed ensilage, is to build a silo. A silo will no doubt help some, but something else is needed.'

LESSONS FOR CANADIAN DAIRYMEN.

These statements as presented by Mr. Goodrich furnish much food for thought by Canadian dairymen. It would be most useful to have a similar cow census taken in a number of different localities in the Dominion. I would draw particular attention to the fact that every dairyman who made a large profit per cow, fed corn ensilage, with one exception. The expensive nature of a cold stable for cows during the winter is made clear. If every dairyman who attempts winter dairying in Canada provided a cement floor in his cow stable, the gain to him in every direction would be great. In very cold weather the cement floor becomes a means of warming the stable by conducting the heat of the earth into the interior. In the cool-curing rooms, with their cement floors, the temperature during the winter has not gone below 40 degrees when

they have been empty and entirely without fires, although the temperature outside has been 20 degrees below zero at times. We have kept a record for the whole winter and the information thus obtained is very suggestive indeed.

By Mr. Cochrane:

Q. What kind of a silo is best?

A. On the whole I think the round silo, and for durability one lined with cement. That is one important thing for us. We can have profitable winter dairying in Canada if we have warm cow stables and ensilage. We will find such dairying profitable.

By Mr. Thompson (North Grey):

Q. Another question. You did not give us any definite figures or final amount as to the quantity of milk used by the family, or in feeding calves, or the quantity of butter used.

A. This was in a dairying section, and the man who took the census, Mr. Goodrich, indicated that there was practically not enough difference per cow to affect the conclusions he drew.

Q. There is, however, in the tables a deficiency on that point, and you could not accept these figures as being accurate?

A. Except as illustrations of important principles, and methods of management.

Q. There might be quite a difference?

A. Yes.

By Mr. Stephens:

Q. Some of these men might have had large droves of pigs?

The Committee adjourned.

Having examined the preceding transcript of my evidence of April 1, I find it correct.

JAS. W. ROBERTSON,

Commissioner of Agriculture and Dairying.

(Addendum to preceding Evidence of April 1, 1903)*

By Mr. J. A. RUDDICK, Chief of the Dairy Division.

THE COOL CURING OF CHEESE

It has been known in a general way for many years that when Canadian Cheddar cheese is exposed to the extreme heat of summer during the period of curing or ripening, there is more or less deterioration in quality, and some unnecessary loss of weight, but it required the experimental results of the last four or five years to show how serious is the injury to the texture and flavour of cheese, and how much is really lost in weight, when the temperature in the curing room is allowed to go too high. We now know that certain undesirable characteristics and defects in the quality of summer cheese, which were considered at one time to be inseparable from the hot season, can be almost, if not wholly, avoided, if means are adopted to secure a proper temperature. The investigations along this line have taught us also that the maximum temperature at which cheese may be cured without injury to the quality is very much lower than was commonly supposed, and further, that the minimum temperature at which proper curing will take place is a great deal lower than any one imagined possible for securing good results. Babcock and Russell have cured cheese at temperatures ranging down to below the freezing point of water, and their work, along with that of Van Slyke, Dean, and others, proves beyond any doubt that cheese may be cured at temperatures as low as 40 degrees Fahr., or even lower, with most excellent results, as far as the quality of the cheese and the saving of shrinkage is concerned. The employment of such a low temperature is generally referred to as 'cold curing,' and if I may be allowed to draw a line of division, I would say that all cheese cured at temperatures under 50 degrees might be called 'cold cured,' to distinguish them from those cured at temperatures ranging from 50 to 60 degrees, which are more properly described as 'cool cured' cheese. At first sight this may appear like making a distinction without a difference, but on the whole, I think there is sufficient reason for making the two classes. The cold curing of cheese introduces entirely new and altogether artificial conditions, because under no circumstances has a natural temperature lower than 50 degrees been employed for the curing of Cheddar cheese. 'Cold curing' entails heavy expenses for refrigeration, and as it takes from 5 to 8 months to properly cure the cheese at 40 degrees, the length of time that the producer would have to wait for his money is something that has to be considered. On the other hand, the cool-curing of cheese is simply an attempt to create conditions at all seasons, similar to those existing naturally when the very best results are obtained. It has always been considered that the finest quality of Canadian cheese is produced during the months of September and October, when the average temperature ranges from 55 to 63 degrees throughout the cheese-making sections of Canada. The Cheddar cheese-maker's ideal is, however, the best of the English and Scotch makes, and it is on these cheese that the taste for Cheddar cheese has been cultivated. It is worthy of note that the average temperature of the English and Scotch curing rooms is not over 60 degrees. The cool curing of cheese, therefore, does not introduce any new conditions, nor does it involve any expense that will not be fully met by the saving in shrinkage, to say nothing of the improvement in quality. Furthermore, it requires only about a week longer at a temperature of 55 to 60 degrees to produce the physical change which we call 'breaking down' as compared with the length of time required

in ordinary uncontrolled temperatures, which may range as high as 80 to 85 degrees. It would appear that the checking of the ripening process is proportionately much more appreciable after the temperature is brought below about 55 degrees, than it is down to that point.

It is along the line of cool curing that the department has been working for some time. During the seasons of 1899 and 1900 an extensive series of experiments were conducted at the Carp Cheese Factory, under Prof. Robertson's direction, and the information thus collected has been freely circulated among those interested in such matters. On several occasions samples of cheese from the same batches, but cured at different temperatures, have been submitted to the Montreal buyers and other experts, and in every case they have pronounced the cool-cured cheese to be superior in quality to the ones cured at ordinary temperatures. The difference in value has been placed as high as 1 cent per pound. The question of improvement in curing rooms, and kindred topics, have been discussed at meetings and through the press, for two or three years past, and the advantages to be derived from such improvements have been clearly set forth, yet there has not been as much progress made in this direction as there ought to have been, and it seemed as if something more was necessary to convince those engaged in the manufacture of cheese that it is a matter of economy to spend sufficient money on the improvement of curing rooms to ensure proper control of temperature at all seasons of the year.

CENTRAL COOL-CURING ROOMS.

With the object of providing a practical working illustration, on a scale sufficiently large to attract general attention, to thoroughly test the commercial aspect of the question, and to get a comparatively large number of people directly interested in the results, Parliament was asked last session to vote a sum of money to be used in constructing four large central or consolidated cool cheese curing rooms.

It is generally known that this plan was carried out, and that curing rooms were built at Woodstock and Brockville in Ontario, and at Cowansville and St. Hyacinthe in Quebec, where sites with siding accommodation were given by the Grand Trunk and Canadian Pacific Railway companies. I shall endeavour to briefly describe these curing rooms, and to give some notes and observations on the results of their operation during a part of the season of 1902.

In describing the buildings I may say first that the temperature is controlled with refrigerating machinery at Woodstock and Cowansville, while ice is employed at Brockville and St. Hyacinthe. The buildings are all designed on one general plan, but where ice is used there is a separate chamber in which it is stored. The curing room proper consists of a basement 9 feet clear between floor and ceiling, and a little over half below the ground level. The stone walls, which do not rise above the surface of the ground, are laid with cement mortar to make them waterproof. The floors are constructed of the best quality of Portland cement concrete. The walls above the stone work consist of 7-ply of lumber and 8-ply of paper, 4-ply of which are of damp-proof quality. The last two courses of lumber on the inside, with damp-proof paper between, are continued down to the floor inside the stone wall. There are two one-inch air spaces in addition to the space between the studs. The ceilings underneath the joists are made of 4-ply of lumber, 4-ply of paper and one air space. Above the joists there is a double flooring with 2-ply of paper between. The spaces between the studding and joists are filled with planing mill shavings.

The ice-chamber is placed at one end of the building, but does not go below the ground level, which brings the floor of this chamber about $4\frac{1}{2}$ feet above the level of the curing room. The insulation of the ice-chamber is rather better than that of the curing room, and differs in two respects: (1) The walls are constructed with 'staggered' studding, that is to say, there are two rows of studs, one for the inside sheathing and the other for the outside, leaving a space of one foot between the two sheathings, with

no connecting pieces. The ceiling is made in the same manner, and the spaces between the inside and outside sheathing are all filled with planing mill shavings. (2) The concrete floor of the ice chamber is covered with 3 inches of dry sand. Above this there is a false floor resting on 2 x 4-inch joists. The lower edges of the main joists are about 6 inches above the top of the false floor. The main floor consists of 2-inch tongued and grooved lumber, covered with galvanized iron, which is flashed along the walls to a height of 10 inches. The space between the floors is filled with planing mill shavings.

The upper story of the building is not insulated, except a compartment used for boxing and shipping. The rest of this flat is utilized for office, receiving room, storage of boxes, experimental rooms, &c. The floor of the shipping room is on a level with the floor of a railway car standing on the track alongside.

The plan for utilizing the cooling power of the ice is simple and effective. Placed just above the floor level of the ice chamber and, therefore, about 4½ feet above the floor of the curing room are three openings, 18 x 9 inches, through which the cold air flows into the curing room. The warm air returns to the ice chamber through three flues, 18 x 9 inches, running the length of the curing room just under the ceiling, and rising to the top of the ice chamber. There are several openings in these flues, which, being fitted with slides, enable those in charge to regulate the temperature so well that it does not vary two degrees from day to day in any part of the room. The ice is not covered, so that the air passing over it is readily chilled and purified and dried to some extent. The insulation of the chamber is depended on to prevent excessive waste of ice.

The mechanical refrigeration at Woodstock and Cowansville is effected with 6-ton vertical, double cylinder, single-acting ammonia compressors of the Linde British type, using the forced air circulation system for cooling.

The size of the curing room proper is 60 x 42 feet, and the five tiers of shelves hold exactly 2,700 cheese, and leave room for storing several hundred more in boxes, but having the cheese of so many factories to keep separate, it is not practicable to fill the shelves all full. The temperature of the curing rooms was maintained constantly between 54 and 58 degrees as long as they contained any cheese. There was not the slightest difficulty in regulating it so that it did not vary more than one degree from day to day. The records of temperature, both in the cool rooms and in the warm or uncontrolled rooms, were kept by means of thermographs, instruments which give a continuous record on paper, so that we know exactly what the temperature was at any time of the day or night.

I need not go further into details of construction, as a bulletin with complete plans and specification, such as will enable anyone to make use of the ideas incorporated in these buildings, is now available for distribution.

Having said so much by way of description, it will now be in order to refer briefly to the plan of operation, and I cannot do better in this connection than by giving the form of agreement between the department and the salesmen of the factories, covering the reception of cheese at the curing rooms.

DOMINION OF CANADA, DEPARTMENT OF AGRICULTURE, COMMISSIONER'S BRANCH.

COOL CHEESE CURING ROOMS.

Cheese will be received at the.....cool cheese curing room on the following conditions:—

The Department of Agriculture will undertake

- (a) To collect the cheese free of charge to the factories.
- (b) To issue warehouse receipts for the cheese as received.
- (c) To store and take care of the cheese during the period of curing without any charge except as hereinafter specified, for a period not exceeding eight weeks.
- (d) To keep the cheese fully insured.

(e) To provide boxes of good quality, box the cheese and ship them according to instructions received from the salesman.

The factories will be charged the usual price of good, ordinary cheese boxes delivered at the factory, and the cost of scale boards, nails, &c., used in preparing the cheese for shipment.

The Department of Agriculture will charge each factory a sum equal to the value of the weight of cheese saved on account of less shrinkage in the consolidated curing room, the amount to be determined by actual tests of shrinkage on the cheese of every weeks' make and the selling price. The factory will have full benefit of any increase in the price of the cheese per pound owing to the improvement in quality.

The Superintendent will not accept any cheese of inferior quality, poor finish or in unsuitable condition.

The Department reserves the right to refuse the cheese from any factory which fails to comply with the requirements or rules of the cool cheese curing room.

The cheese are to continue the property of the factory, and to be at the disposal of the salesman.

J. A. RUDDICK,
Chief of Dairy Division.

OTTAWA, April 8, 1902.

Approved (Sgd.) JAS. W. ROBERTSON,
Commissioner of Agriculture and Dairying.

On behalf of the
conditions for cheese delivered at the government cool cheese curing room at.....
.....

Salesman.

Date.....190

The curing rooms were not ready for use until the first of July, but from that time until September 30, cheese were received every week day, until the latter part of September, when they were collected only every second day. During these three months, 26,531 cheese from 37 factories were handled at the four places, divided as follows:—

	Factories.	Boxes.
Woodstock..	9	11,657
Brockville..	10	6,644
Cowansville..	14	6,266
St. Hyacinthe..	4	1,964
	37	26,531

If cheese had been received from the middle of May the number would have been nearly 40,000. The factories from which the cheese came are all located within about 10 miles of one of these curing rooms, and practically all the factories within that radius joined in the scheme. In fact, the only difficulty experienced in this connection was that the applications of several factories had to be refused. The number received at St. Hyacinthe was smaller than what was expected, because several of the factories in that district made butter instead of cheese. The capacity of the Woodstock curing room was rather overtaxed, handling 11,657 cheese in three months, while the others might have taken care of a few more. About 100 cheese per day, or between 11,000 and 12,000 cheese during that part of the season when cool curing is beneficial, about represents a good working capacity of these establishments. Special boxes were provided for carrying the cheese from the factories to the curing rooms. Two kinds were tried, one made of tin and the other of wood like an ordinary cheese box, only of heavier material and more strongly made. The wooden ones were found to be the more satisfactory, and cost only about one-third of what the tin ones did. They were

made to fit the cheese snugly, and as for durability, I may say that out of 400 in daily use for the three months, not more than half-a-dozen have been broken.

THE SAVING OF SHRINKAGE.

As the cheese were collected from the factories, a number from the same vat from all the factories were set aside each week, and after being carefully weighed to two ounces, one was placed in the curing room and the mate to it was put in a room in the upper storey, where the temperature was not controlled. When the cheese of the corresponding week were sold, these cheese were again weighed as before, and the difference in shrinkage noted. From this difference the saving in shrinkage on the whole lot was easily calculated. Table I gives the details of shrinkage and temperatures for three typical lots. Table II shows the actual saving of shrinkage on all the cheese.

TABLE I.

Date Weighed.	Cool Curing Room.					Uncontrolled Room.					Shrinkage Saved.	
	Weight.		Loss.		Temper- ature.	Weight.		Loss.		Temper- ature.		
	Lbs.	Ozs.	Lbs.	Ozs.		Lbs.	Ozs.	Lbs.	Ozs.			
Lot 1—Aug. 9.. Sept. 8..	80 78	2 6	 1	 12	} 54—56	82 79	0 12	 2	 4	} 61—77	0	3
Lot 2—Sept. 12.. Oct. 11..	81 80	12 4	 1	 8		} 52—56	82 78	0 12	 3		 4	} 50—72
Lot 3—Sept. 13.. Oct. 11..	85 83	4 8	 1	 12	} 52—56		83 79	4 14	 3	 6	} 50—72	

TABLE II.

	Cheese.	Lbs.	Percentage Shrinkage Saved.	Amount Saved.	Value at Selling Price.
				Lbs.	\$ cts.
Woodstock ..	11,657	906,560	1.56	14,327	1,424 13
Brockville ..	6,644	526,950	1.52	8,050	814 48
Cowansville ..	6,266	494,296	1.34	6,640	662 02
St. Hyacinthe ..	1,964	143,190	1.66	2,386	238 41
Totals ..	26,531	2,070,996	1.51	31,403	3,139 04

If these figures are raised to what they would be if operations had been commenced at the middle of May, the value of the saving in shrinkage would be something like \$4,500. This sum represents the interest at 6 per cent on \$75,000, or in other words would provide for a capital outlay of over \$2,000 for each of the 37 factories. This is certainly a low estimate, because, as everyone knows, the past season was remarkable for the very cool weather and moist condition of the atmosphere which prevailed all summer. In an ordinary season the saving of shrinkage would be very much greater, because a high temperature and a dry air are the two conditions that increase the shrinkage.

IMPROVEMENT IN QUALITY.

But the saving of shrinkage is only a minor consideration. The main one is the great improvement in quality. Altogether 480 pairs of cheese were set aside as already mentioned, for testing the shrinkage, one being cured in the cool room and the other in an uncontrolled temperature. These cheese are still in the possession of the Department, having been bought from the factories when sales were made. They have been examined and compared by a large number of cheese buyers, cheese-makers and others, and in every case the cool cured cheese has been pronounced the best in quality. Out of something over 500 lots of cheese sold out of the four cool-curing rooms, I have only heard of two lots of which there was any fault found with the quality. In one of these cases the cheese were sour, and in the other they had a bad flavour even when freshly made. There was some complaint about mould on the cheese at first, but this is another matter, and does not affect the question of cool curing.

THE EFFECT OF A HIGH TEMPERATURE ON THE QUALITY OF CHEESE.

Having the cheese from 37 factories to deal with, there were many opportunities for observing and studying the effect of a high temperature on the quality of cheese of different character.

The first effect of a high temperature, and one which is always noticeable, is to make the texture of the cheese rough and mealy, and in extreme cases show a greasiness which is undesirable; or in other words it destroys that silkiness of texture always present in cheese at its best. Bad flavours are intensified at the higher temperature, and many cheese go 'off' flavour, while their mates that are cool-cured remain sound and clean. All cheese become sharp and 'tasty' much quicker at the high temperature. Of course cool-curing will not make a fine cheese out of a poor one, but still cheese which are a little weak and open, or on the other hand have a little too much acid, show up better when cool-cured than they do when cured at ordinary hot weather temperatures.

Now this brings us to the question, what is a high temperature for curing cheese? Cheese-makers have, in the past, considered that their cheese were fairly safe as long as the curing room was not warm enough to cause the fat to exude from them, and yet it requires a temperature of about 74 degrees to make the cheese show grease on the surface. It is not many years since 70 degrees was recommended as a suitable temperature for curing. Careful observation on this point during the past summer has established the fact that positive injury follows, as soon as the temperature goes above 60 degrees. As a matter of fact, the temperature in the ordinary room at the Brockville curing room went over 74 degrees only on sixteen days during the summer, and on two days only did it reach 80 degrees. For the rest of the time it averaged about 70, until the last half of September, when it varied from 60 to 70. This record is very low, and in an average summer it would be about 10 degrees higher, but I mention it to show that the difference in quality and the saving of shrinkage which I have already quoted, is simply the result of curing cheese on the one hand at a temperature considered about right a few years ago, and comparing them on the other hand with cheese cured between 55 and 60.

MOULD ON CHEESE.

Some difficulty was experienced at first in preventing the growth of mould on the cheese, owing to the excessive moisture. There can be no ventilation without bringing air in from outside, and to do so when the outside air is warmer than that inside would only make matters worse, inasmuch as warm air that may be relatively dry, will, when cooled sufficiently, reach the point of saturation, and deposit moisture on all exposed surfaces. Under ordinary circumstances, if the warm summer air is cooled down to 55 or 60 degrees, it will become saturated with moisture; therefore, it is not only use-

less, but highly undesirable to have a cool-curing room ventilated except when the outside air is cooler than the inside. Of course there is always some outside air introduced into the best constructed buildings, but the chief source of moisture in these cool curing rooms, with their good insulation, was the evaporation of water from the cheese as they dried out in the curing. Our records show that 14,000 pounds of water, as represented by the shrinkage, was evaporated from the cheese in the Woodstock curing room during the three months of its operation.

The remedy for excess of moisture in a cool-curing room is rapid circulation of air, through the room and over the cooling surface, where the excess of moisture will be deposited. When the circulation is poor, the moisture hangs around the cheese from which it evaporates, and thus makes a condition favourable for the growth of mould. The ice cooling system provides for circulation, and as the air passes over the ice it is chilled and thus loses part of its moisture. In this way the large quantity of water coming from the cheese is constantly being disposed of. The relative humidity of the Brockville curing room remained fairly constant at 88 per cent and the cheese began to show signs of mould after being there about a week, just as they do in many of the cheese factories.

It is desirable that the cheese should be free from mould, and we do not look for any trouble on that point hereafter. There is always a tendency for mould to grow in a new curing room, and it is not likely that we shall have another season for some time with as high relative humidity in the atmosphere as there was last summer. Moreover, some measures are to be adopted to ensure the cheese being drier on the surface when delivered at the curing room. It was noticed particularly that certain cheese that were delivered to the curing rooms with wet surfaces were always first to show signs of mould,

THE CEMENT CONCRETE FLOOR.

The cement floor is an essential part of the plan of these cool-curing rooms. It necessarily lies on the ground, and being a good conductor of heat, its surface has a constant temperature of about 50-58 degrees, according to locality and the character of the earth immediately underneath it. It requires no argument to show that the cement floor is a great aid in maintaining an even temperature of 55 to 60 degrees in any room where such construction has been followed. It would appear to be a very fortunate thing that the cool cheese curing temperature and the natural temperature of a cement floor are so close together. As an evidence of how the cement floor keeps the temperature down in a well insulated room, I may state that the cool air from the ice was not turned on at the Brockville curing room until July 8, and the temperature never went above 60 degrees, although it went as high as 76 in the room upstairs, and about 1,000 warm cheese had already been placed on the shelves up to that date. On the other hand, the temperature in this curing room did not go below 50 until November 22, when it gradually dropped without fluctuation, to 42 degrees on December 10. On the same date the thermograph in the room upstairs registered 10 degrees, and the outside temperature was 20 below zero. This is not important except in showing the controlling effect of the cement floor. In future construction of cheese factories and creameries there should be no question about putting in cement floors, except in butter refrigerators, where the concrete requires to be insulated.

CONCLUSIONS.

Before concluding these remarks I may be permitted to make some observations of a general character bearing on this question.

One cannot estimate the great benefit that would accrue to the Canadian cheese industry at large, if all the cheese were cool-cured. We have in the past season a most excellent illustration on this point, inasmuch as the comparatively slight improvement in quality due to the unusually cool weather which prevailed all summer, had the

effect of encouraging consumption to such an extent that the demand forced prices up to a point that few ever expected to see again. The situation suggests possibilities in the future of the industry that are certainly very encouraging.

In regard to the central or consolidated curing room idea, I would like to point out that the Department does not urge the general adoption of this scheme. I have already mentioned the reason for the establishment of those now in operation. If they are the means of convincing those engaged in the trade of the necessity for adopting some plan of cool curing, their object will have been attained. The desired result will probably be reached in different ways, according to local circumstances and conditions. The larger cheese factories will, I think, be inclined to make the necessary improvements in connection with their own buildings. Already a number are preparing to do so.

Combination, or consolidation, may be affected in some cases, but the jealous rivalry which exists among factories stands in the way. It is probable that the exporters themselves may in the future have something to do with the curing of some of the cheese.

I see one obstacle in the way of getting improvements made in proprietary concerns, and it is this: Nobody needs to be told that any saving of shrinkage or enhanced value in the cheese will go directly into the pockets of the patrons, and very little of it will stick to the fingers of the manufacturer. It is hardly fair, therefore, to expect the man who owns a factory to meet all the expenses of improvements from which he will receive no benefit, especially in view of the fact that the commission which he receives at present is not sufficient to provide decent buildings and proper equipment, and at the same time leave a reasonable margin of profit. If patrons desire this increased revenue, and there is no doubt they do, they must be willing to make concessions to the factory owner to get it. Patrons of cheese factories should pay a fair price for making and then demand the best possible service in return.

